

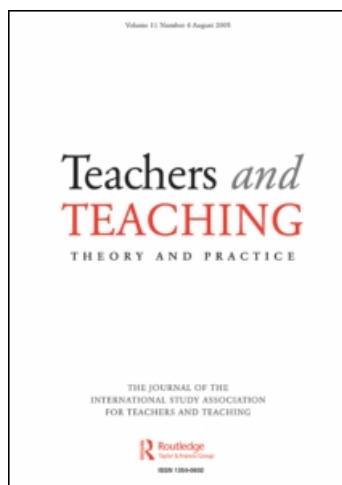
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Teachers and Teaching

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713447546>

Teaching as disciplined enquiry

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To cite this Article Mason, John(2009) 'Teaching as disciplined enquiry', *Teachers and Teaching*, 15: 2, 205 — 223

To link to this Article: DOI: 10.1080/13540600902875308

URL: <http://dx.doi.org/10.1080/13540600902875308>

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Teaching as disciplined enquiry

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(Received 16 September 2008; final version received 20 November 2008)

This paper is designed to raise issues around how we view teaching and some of the implication that has for thinking about teaching as a discipline. The paper is built around the concept of ‘noticing’ from some of my earlier work and aims to push ideas about teaching in ways that are intended to provoke readers into thinking more deeply about how they conceptualise teaching and all that that involves. The paper is organised in such a way as to invite critique using the idea of teaching as disciplined enquiry because teaching, in its full sense, requires ongoing study of oneself in order to be sensitive to learners, ongoing enquiry as to the sense that learners are making, and ongoing enquiry into the subject matter of the discipline. This enquiry involves multiple domains: subject epistemology and ontology; pedagogic strategies and didactic tactics; and psychosocial specifics of situations involving human beings, who can be agentive in exercising their will as to what they attend to, and how. Put another way, in order to remain fresh and sensitive to learners, it is essential for teachers to refresh their sense of the disciplined ways in which natural human powers are employed in the subject, of the role of fundamental themes, practices and awarenesses which comprise the subject and its discipline, and of the particularities of the learners in their historical-cultural and institutional setting. Thus, teaching is fundamentally enquiry in the domain of human attention and awareness.

Keywords: teaching; reflection; enquiry; discipline of teaching

Introduction

I begin with an outline of the development of my thesis that teaching is usefully seen as disciplined enquiry. The first section is organised around the idea of making an assertion then offering a brief explanation in terms of consequences for teaching. The succeeding sections of the paper then add flesh to these bare bones in order to fully build the argument.

Agentiveness and mechanicality

Assertion: Human beings are potentially agentive even if their actions are frequently driven by automatism based on habit. Consequently, cause-and-effect as a mechanism is not useful for theorising about or informing effective teaching: not only context, but the learners as agents, matter.

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Consequences for teaching: This is the basis for teaching to be seen as ongoing enquiry rather than a combination of a storehouse of knowledge and a mastery of pedagogic mechanisms.

Natural powers

Assertion: Learners arrive at educational institutions having already demonstrated natural powers of sense-making. Learning involves developing those powers in subject-specific ways, combined with changes in disposition to attend, changes in what is attended to and changes in how that attention is structured.

Consequences for teaching: This assertion is based on the view that ongoing enquiry into the use of one's own powers is vital in order to develop, maintain and enrich sensitivity to others' use of their own powers. In order to direct other people's attention effectively, it is necessary to be aware of both what you are attending to, and how you are attending to it. This is a matter of ongoing enquiry.

Teaching and learning sites

I do not assume that what is taught is what is learned, nor that what is learned is learned immediately or even as a result of any simple cause-and-effect mechanism initiated by teaching.

Assertion: Teaching takes place *in* time, as a succession of acts; learning takes place *over* time as a result of maturation and co-evolution of perceptions, conceptions and alterations through transformations in the structure of *attention* and *awareness* arising through experience of activity.

Consequences for teaching: Appreciation and understanding of different topics is not a binary matter: either you do or you do not understand. Rather, it is potentially an ongoing process of enrichment even if it can stagnate or remain dormant for periods of time.

Structure of topics related to structure of the psyche

Assertion: To promote learners' understanding and appreciation of topics, it is necessary to 'psychologise the subject matter' (Dewey, 1902/1971), which can be seen as arranging for learners to encounter aspects of topics that relate to the human psyche.

Consequences for teaching: Understanding and appreciation of subject-specific topics is a dynamically evolving process of ongoing realisation, dependent on disposition and volition. Again, appreciation and understanding of different topics is not a binary matter: either you do or you do not. Rather, it is potentially an ongoing process of enrichment even if it can stagnate or remain dormant for periods of time.

Actions, awareness and attention

Assertion: Teaching involves provoking learners to make use of familiar actions in unfamiliar ways in order to meet fresh challenges, and supporting learners in drawing back out of activity (reflecting) in order to learn from their experience. Actions are based on awareness which may be unconscious (as in somatic actions), semiconscious (as in trained behavioural habits) and conscious. Awareness can be educated, whereas behaviour can be trained, and these transformations take place through learners drawing upon or 'harnessing' the flow of energies through their emotions.

Consequences for teaching: Ongoing enquiry into the actions available to learners and into ways of both triggering them and making them available for inspection involves ongoing enquiry into the origins of the actions which underpin different topics. Ongoing enquiry into the origins and variations of those actions in one's own experience is necessary in order to be sensitive to learners.

Since teaching is fundamentally about connecting with learners so that what is said and done is meaningful to them, teaching is fundamentally a disciplined enquiry in the domain of human attention and awareness. To be effective requires sensitivity to learners' states and powers, and this is only possible through ongoing enquiry into your own attention and awareness. The underlying assumption is that in order to be sensitive to others, it is necessary to refresh your sensitivities to yourself, and this can only be done through self-knowledge, which encompasses subject matter epistemology and ontology, pedagogic strategies and didactic tactics, and the psychosocial specifics of the situation.

Agentiveness and mechanicality

As Dean Swift (1726) put it, human beings are not so much 'rational animals' as 'animals capable of reason'. Put another way, although Pavlov and Skinner were able to show how human beings can be trained to behave in certain predetermined ways, what the behaviourist movement did not address is the fundamentally agentive disposition of human beings who can exercise will, through which they can direct and guide both movements of their attention and engagement of their energies. Thus education, especially in Western cultures, is increasingly a socio-psychological engagement with agents, rather than a filling of some *tabula rasa* or training in behavioural and emotional dependency on social rules, as envisioned, for example, by Immanuel Kant (1899/2003).

Indeed, the more that young people are able to exercise choice outside of school, economically and socially, the more complex adolescence becomes as a domain of choice-making within social constraints, and the more it behoves teachers to engage with the agentive rather than the mechanical aspects of the psyche of their learners. Training behaviour is perfectly possible, and can be done efficiently. However, the mechanical or habitual practices produced by trained behaviour are rarely flexible enough to deal with minor, much less major, changes or added difficulties. In other words, maximising opportunities for learners to make significant subject-pertinent and personal choices is likely to support the development of agentiveness, and so to maximise engagement and hence increase the potential for learning.

It follows therefore that mechanical cause-and-effect is an inappropriate metaphor for how learning takes place, and hence as a basis for how effective teaching can be conducted. Seeing teaching as a caring profession which takes into account the social and psychological particulars of each individual and each group is far more appropriate. However, one of the implications of this is that teaching becomes much more than a matter of 'knowing your subject' and 'knowing how to present it'. It becomes an ongoing disciplined enquiry, as the remainder of this paper claims.

Natural powers

Every learner arrives at school having already displayed fantastic powers for making sense of experience (Dewey, 1913; Gattegno, 1987; Kant, 1899/2003; Whitehead, 1932), including:

- imagining and expressing (in movement, words, drawings, sounds, etc.);
- specialising and generalising (the basis of language);
- conjecturing and convincing (oneself and others);
- organising and characterising; and
- stressing and ignoring (the basis of generalisation and abstraction and hence of conceptualisation).

These powers can be called upon in mathematics (Mason & Johnston-Wilder, 2004) and presumably in every other subject discipline. For example, learning involves exercising imagination in subject-pertinent ways, and expressing this through subject-conventional means (e.g. medium, technical vocabulary, etc.). It involves the use of case studies to exemplify the range and scope of constructs, so as to appreciate appropriate forms of generalisation, and how they are conjectured, tested, validated and justified in that subject. Each subject-sub-discipline has characteristic ways of organising and characterising the objects of study and the methods employed in that study.

A hallmark of a subject discipline is the ways in which it stresses some features as relevant and ignores or backgrounds others as less pertinent. Gattegno (1970, 1987) recognised this as the basis for generalisation (with respect to relationships) and abstraction (with respect to properties), thereby laying the foundation for conceptualisation. Teachers can serve learners well by amplifying and editing their expressions; that is, directing learner attention by guiding learners in stressing and consequently in down-playing, back-grounding or even ignoring (Hewitt, 1994).

Nothing is more attractive than using your own powers nor more deadening than having the use of your powers usurped by someone else. Where they are usurped because the teacher or the textbook tries to do the work for learners, learning is at best impoverished and at worst liable to be rejected. When learners use, and so develop, their own powers, their motivation and engagement deepens, as does their disposition to engage in the future.

Effectiveness (in the sense of learners using their powers more widely and, potentially, in more contexts) depends upon ongoing enquiry into how learners' powers can be provoked and evoked, how those powers are pertinent to the subject matter, and ways to draw learner attention to the fact of these powers, thereby enabling learners to initiate their use more effectively in the future.

Using powers

To be sensitised not to usurp learners' use of their own powers but rather to promote, provoke and invoke those powers, it is vital to refresh sensitivity to their presence and use. In other words, teachers who do not continue to engage in their discipline by being challenged intellectually and motivationally are blunting their possible effectiveness. This is one aspect of teaching as a disciplined mode of enquiry.

For example, the psychological-pedagogic construct of scaffolding and fading provides a case study. Instruction can take the form of training in the use of recipe-like procedures, but it can also take the form of challenges which invoke the use of powers and practices in fresh ways. Throughout recorded history, educators have railed against rote learning based entirely on trained behaviour (e.g. Dewey, 1913; Skemp, 1976; Spencer, 1878; Whitehead, 1932), stretching back to Plato (see Hamilton & Cairns, 1961).

It is not enough to use a few pedagogical strategies repeatedly. Learners quickly fall prey to dependency by building habits and expectations. In order not to train learners in dependency, teachers can guide learners by means of direct prompts to actions, which are then gradually made less and less direct, to fade the support while encouraging learners to take over the initiative. Teachers who are alive to their teaching are constantly fading their provocations and support for one practice, while introducing others, so that learners continue to extend and enrich the range of actions that come to mind both within the learning situation and beyond. Bruner (1986, pp. 75–76) referred to a teacher as being able to act ‘as consciousness for two’, having more free attention than the learner who needs to focus most of her or his attention on carrying out actions which are not yet internalised. This scaffolding (Wood, Bruner, & Ross, 1976), together with requisite fading (Brown, Collins, & Duguid, 1989; see also Floyd, Burton, James, & Mason, 1981; Love & Mason, 1992), can be used deliberately to enculturate learners into pertinent practices and to promote internalisation (Vygotsky, 1978, 1981).

Brown and Coles (2000) provide a prime example in reporting on learners who picked up the teacher’s use of the pedagogic strategy of asking ‘what is the same and what is different about ...’ two or more objects, and, over a period of time, using it with each other and for themselves. This movement from the externally to the internally triggered was what Vygotsky was trying to get at in his notion of the *zone of proximal development* (Mason, Drury, & Bills, 2007; van der Veer & Valsiner, 1991). Scaffolding can only be said to have taken place once the scaffolding has been removed through a process of fading, so that prompts become less and less direct until learners spontaneously act of their own accord.

The only way to sensitise yourself to opportunities to promote learners’ use of their own powers and to avoid usurping those powers is by using, developing and becoming ever more aware of your own use of your own powers. If you are unaware in the moment of how you are using your own powers, you are unlikely to be aware of possibilities for learners to use their own, and certainly unaware of opportunities to fade your prompts so as to turn direct instruction into scaffolding-and-fading. An important contribution is played by ongoing engagement for oneself in the subject discipline, where attention is not so much on the discipline as on the use of powers, and the role played by subject-specific themes and heuristics.

Attention

If learners are not attending to what the teacher is attending to, then communication can be at best partial. Of course, the learner apparently gazing out the window or sitting with eyes partly closed may indeed be attending to something else entirely, but may also be attending very closely to what the teacher is saying and doing, whereas a learner apparently watching what the teacher is doing may not actually be paying sufficient attention or paying attention in a suitable manner. So attention-directing is a complex matter. It is further complicated by the fact that even when learners are attending to what the teacher is attending to, they may be attending in different, even incompatible ways (Mason, 2001).

For example, sometimes attention has the structure of gazing, in which some object or thing is the focus of attention, holistically, often virtually: the object of attention may not be present, or attention may be drawn through and beyond the specific particular. Gazing can be described as ‘holding wholes’ without focusing on details,

though the 'whole' may itself be a detail in some larger scene. For example, when meeting someone in a crowded place such as an airport arrivals area, you can actively and specifically scan each person as they come through the door, or, if the person is familiar, you can gaze in the general direction confident that when they appear you will recognise them. Gazing is at the same time completely familiar yet requires educating, since the richer the experience brought to gazing, the richer the range of responses that are likely to come to mind. Learning to let go and to allow the situation to 'speak to you' is an important part of expertise development in any discipline, often overlooked in the rush to communicate testable facts and procedures. For teachers, allowing the classroom situation to inform choices of actions requires confidence to allow the situation to trigger reactions and to resonate possible responses. Being open to multiple possibilities rather than reacting according to the first thing that comes to mind takes time to acquire.

By contrast, novice teachers sometimes actively scan the classroom looking for specific details: someone interrupting the lesson; signs of appreciation and understanding or signs of boredom and confusion and so on. At these times, different details are discerned: 'this' is distinguished from 'that'; differentiation and identification of components occupies attention. These discernments are ontological moves which are usually specific to the subject discipline. In a classroom, movement of a hand or head may be construed as an indication of a degree of understanding or of a quality of participation. More generally, distinctions are likely to be informed by, if not characteristic of, the particular subject discipline. For example, colour, shape and sound may or may not be relevant in different disciplines, and part of being educated in a discipline is becoming sensitised to what is important or pertinent to the practices in that discipline. Thus in mathematics, colours used with symbols and diagrams is for clarity but rarely relevant to the topic itself; whereas in art, colour is a core component. Experienced teachers are sensitised to notice fine details which novices are simply not attuned to notice. It is an ongoing enquiry for teachers to sensitise themselves not only to indications of appreciation, understanding, participation, productive and unproductive confusion, and how these manifest themselves in each different topic, but to indications of relevant and appropriate subject- or topic-specific attending.

Attention can also be directed towards relationships between specific particulars, between discerned details as objects. Individual words in a poem are details, but what matters are relationships between words, just as reading requires attention to relationships between letters, not individual letters as such. Yet a learner who is working on whole lines or verses as their 'unit of analysis', their discerned detail, does not have access to relationships between words until their attention shifts. In mathematics, each instance of the same symbol in a sequence of reasoning steps refers to the same mathematical object; if the learner is frightened of all the symbols and remains at the line or even 'paragraph' degree of discernment, they are not going to appreciate the mathematical reasoning.

What shapes a discipline is the perception of relationships as instances of properties. A phenomenon is a collection of relationships which are perceived as similar in different situations: the abstraction from particular instances. The shift from particular to seeing the general through the particular, and the reverse, seeing the particular in or as an instance of the general, is what makes a subject discipline into a domain of study. Ways in which attention is shifted or, more accurately, in which attention shifts are described and assumed, characterise different subject disciplines. Again teaching itself

is no different to other domains of enquiry. For example, recognising epistemological and ontological stances of learners is important, but insufficient for effective teaching. It is also necessary to experience them as instances of phenomena, because this is what provides access through metonymic triggering and metaphoric resonance with associated choices of actions which come to mind as ways to trigger shifts for learners. Recognising a relationship (a situation or incident) as an instantiation of a phenomenon (perceived as a property that may be being instantiated) opens up possibilities for departing from habitual, internalised or integrated functioning. In the case of teaching this means possibilities for creative teaching. The movement from recognising relationships to perceiving properties is often very subtle. It is enhanced by being in a culture of reflective practices in which questions such as 'what is the same and what is different about two or more instances' are commonplace. One way to support this delicate movement is for colleagues to trade descriptions of incidents which they think might be examples of the same or similar phenomena, and to negotiate what it is about the incidents that they think is similar. Examples of epistemological shifts among Harvard undergraduates were described by Perry (1968; see also Copes, 1982).

Learning to reason within a subject discipline involves not only gaining fluency in the conventional use of technical terms to denote perceived properties, but assembling these in ways which lead others to similar experiences of sameness-and-difference, of cause-and-effect, of relatedness as instances of properties, of potential influence. The way these are discerned and handled is characteristic of the reasoning patterns of the subject discipline. For teaching, learning to 'reason' includes justifying choices of actions by reference to assumptions, beliefs and espoused theories. It also means collecting brief-but-vivid accounts of incidents which illustrate phenomena and which, when juxtaposed with other incidents, can create a rich support for alternative ways of responding when similar incidents are detected in the future (Mason, 2002).

These different forms or 'structures' of attention: *gazing or holding wholes, recognising relationships, perceiving properties* and *reasoning on the basis of properties* have different manifestations in different subject disciplines. We know that people's attention can take any of these forms, often in quick succession, but can sometimes become stuck in or enamoured of one or two particular forms. To be a responsible adult involves gaining control over these different forms of attention. Thus responsible teaching involves providing opportunity and motivation for learners to experience subject-pertinent shifts in the structure of their attention. It is in enriching, broadening and deepening sensitivities to these that teachers extend their repertoire of effective pedagogical strategies and didactic tactics.

Put another way, the 'shifts conjecture' (Mason & Davis, 1988) proposes that in any domain of enquiry, each technical term and each new method signal the fact that people experienced a shift in the way they attended, in how they perceived, in what they conceived, and that in order to 'learn' to use those terms and methods effectively, learners need to experience some corresponding shift in the way they attend, perceive or conceive. Thus becoming aware of fundamental shifts in attention which underpin the introduction of technical terms or new methods in a discipline makes it then possible to be on the lookout for ways of working with learners that prompt or promote similar shifts in them. Since experiencing shifts of attention which help resolve some problematic involves the learner using their own powers, there is a potential frisson of excitement, and brief flow of energy which can heighten motivation and strengthen disposition to engage further. This applies to teaching as well as to other domains.

That fleeting moment of pleasure when a learner makes a shift is part of what makes teaching so rewarding.

If some people are gazing and others are discerning details, then what is said by one may not make much sense to others. If some people are recognising relationships while others are focusing on discerning details, then again communication may be less than maximally efficient and effective. If some people are attending to particular relationships, while others are experiencing them as instances of more general properties, then yet again communication is likely to be confused. The possibilities for mismatch seem manifold!

According to this analysis, it is essential that in order to be alive to their teaching, teachers are engaged in ongoing enquiry into the movements of their own attention and the ways in which different forms of attention are pertinent at different times and in different situations.

Teaching and learning sites

As already mentioned, I maintain that acts of teaching take place *in* time, while learning is a maturational process which takes place over time. There is a wide range of factors influencing the process, but none of these are definitive or crucial, since all can be, and most have been overcome in individual cases. You cannot observe learning, though you can observe the results of flows of energy released by sudden insight and by maturation over time. The relationship between teaching and learning is like phase change in physics, where at times, energy put into a system produces a rise in temperature, until, suddenly, more energy produces no rise in temperature (because bonds are being broken) and then, after sufficient energy has been introduced, the temperature starts to rise again. So, too, learners sometimes do not appear to pay attention to advice or to instruction, do not seem to improve their performance. Then suddenly, performance changes. For example, young children using regular rules for past tenses of irregular verbs appear to ignore corrections by adults, and then suddenly form them correctly. Similarly when a coach alters the way you hold a golf club or racket, at first your performance is likely to decline rather than improve, despite all the attention.

A consequence of this phenomenon is that enquiry has to be ongoing in order to detect evidence of learning. Expecting people to have learned something at the end of a lesson suggests that the actions available to them to carry out have been transformed or augmented in some way in the short term, but this is well known to be highly unstable over time (hence the need for delayed post-tests in research studies). Testing people on actions they are supposed to have internalised and integrated into their functioning is of little interest, as Vygotsky noted (van der Veer & Valsiner, 1991) since it reinforces a deficit model of learning and hence teaching, rather than a developmental approach taking maturation into account. Rather, what is of interest is those actions that can be triggered by a more experienced other, and which learners are on the verge of being able to initiate for themselves. This is the essence of Vygotsky's *zone of proximal development* (van der Veer & Valsiner, 1991) and represents a transformation in the actions learners can initiate and carry out.

Ference Marton (Marton & Booth, 1997; Marton & Trigwell, 2000) articulates this differently. He sees learning as evidenced by an expansion of the dimensions of possible variation (what can be changed in examples of a concept or problems susceptible

to a method of solution) of which the learner is enactively aware (revealed through the recognition and construction of examples), and the range of permissible change in each of those dimensions. The link between teaching and learning is sufficiently tenuous yet vital that only those engaged in observation over the long term are able to detect development, and even then, it is difficult to ascribe causality to effects.

Structure of topics

In this section, I develop claims about the ‘psychologising of subject matter’, as Dewey (1913) put it, which call upon ongoing enquiry by teachers both into details of the psyche-related aspects of topics, and into how learners can be prompted to encounter these in assimilable ways.

Awareness, behaviour and emotion

I follow Caleb Gattegno (1987) in using the term *awareness* to mean the basis of actions. It is what enables actions to be initiated and carried through. Thus we have (unconscious) somatic awareness to govern breathing, pulse, growth spurts and the functioning of the immune system, among others. Habitual actions once may have required attention to ensure their successful application, but having been internalised, require little or no attention until something goes wrong. Here ‘internalised’ is a description of the result, not whether the learner has engaged in any overt or conscious acts. Thus ‘internalised’ includes unconscious habituation or enculturation as well as consciously rehearsed practices. Internalised actions depend on awarenesses (the bases for action), which may be difficult to bring into consciousness. Even more difficult to trap is what triggers that awareness into action.

Gattegno was fond of saying that ‘only awareness is educable’. By extending the use of ‘awareness’ to all actions, he concluded that each subject discipline arises when people become aware of actions that they can carry out. They become aware of awarenesses. For example, the notion of *set* or *collection* arises when we become aware of the awareness which enables us to discern and distinguish objects according to some criterion (the power to discern and, through stressing and ignoring, to characterise); the notion of *number* arises when we become aware of the implicit awareness that discernible objects can be put in order (relationship) and matched one-to-one with other sets of objects.

In contemplating differences between awareness and behaviour, I have found it useful to draw on an image found in several of the Upanishads (see, e.g. Radhakrishnan, 1953, p. 623). It presents human psyche metaphorically as a chariot (the body), drawn by horses (the senses, and more generally, the emotions), directed by a driver (cognition) through the use of reins (mental imagery), under the instructions of an owner (will). The horses are connected to the chariot by shafts (habits). The image suggests a way to extend Gattegno’s challenging assertion that only awareness is what is educable, by adding that ‘only behaviour is trainable’ and that ‘only emotion is harnessable’ (Mason, 1991).¹ For example, Pavlov and Skinner showed beautifully how behaviour can be trained. But what is trained is *only* behaviour, as those who try to get learners to learn by rote discover when learners are then examined by non-routine probes. Emotions provide the motive energy, the ‘motivation’ so these energies need to be channelled appropriately.

The following three assertions are intended to be challenging:

- Only awareness is educable
- Only behaviour is trainable
- Only emotion is harnessable

They can act as *protasis* (syllogistic assumption) to people's past experience to initiate a transformatory action as they contemplate the consequences for their own practice. Although teachers can undertake to train learner behaviour, they cannot educate learner awareness nor harness learner emotion. Teachers can only create conditions in which learners can make the choice to do this for themselves. Even training behaviour requires subordination of the learner to the trainer before anything can happen, and this requires a personal (and often ongoing) choice.

Positive and negative learning

Learners always learn something, just as you always find something in the last place that you look: the issue is whether what is learned has to do with deepening connections with the core of the subject and developing powers of sense-making pertinent to the discipline, or with finding ways to avoid or escape significant engagement and amplifying a disposition to avoid further encounters (Dewey, 1913). In order to contribute to positive rather than negative learning (learning what is intended rather than, e.g. what is unintended), it is essential that teachers are sensitive to their learners and sensitised to notice opportunities for initiating and guiding actions which will, in turn, offer learners opportunity to encounter further challenge and so refine and develop their sense-making powers, or in other words, learn.

Being sensitive to learners means much more than taking into account their personal likes and dislikes, their dispositions and their propensities. It means being familiar with details of the particular topic and of modes of enquiry in the subject itself so that appropriate, pertinent topic- and subject-specific prompts to action come to mind when appropriate. It means having a disposition to enquire within the subject matter, thereby displaying modes of enquiry. It means refreshing your own thinking so as to have recent experience on which to draw in order to recognise and appreciate learners' struggles. It means attending to learners as individuals, and to groups of learners as groups, using psychological and sociological techniques.

Much of the educational research literature could be characterised as trying to locate causal mechanisms which will convert trained behaviour into educated awareness. In Gattegno's terms this is a lost cause, because inappropriate parts of the psyche are used. Put another way, teaching as disciplined enquiry involves considerably more than the search for suitable training instruction in order to impose subject-disciplined behaviour on learners. Trying to motivate learners by calling upon their reasoning or their likes and dislikes is at best an impoverished approach to harnessing emotional energy, again through inappropriate use of the psyche, as Dewey (1913) pointed out so eloquently. A more effective approach is to catch learner interest so that they harness their natural energies arising from use of their own powers of sense-making, as mentioned earlier, for these are the true origins of meaningfulness.

Meaningfulness and relevance are not attributes of objects, tasks or topics. Rather they are attributes of stances taken by people. It is useful to think in terms of a *zone of proximal relevance* which is a projection of the ZPD into affect: what learners can become interested in, intrigued by, engaged in, as a result of suitable invitations by a teacher (see Mason et al., 2007). Relevance (realness, meaningfulness) must

constantly expand, otherwise learners will be trapped in a narrow world of likes and dislikes. Often it is only through being led into new experiences that people discover talents and interests.

Structure of a topic related to structure of the psyche

If learners are not in the presence of someone who is themselves enquiring, then they are likely to form the conclusion that topics are static and predetermined, third-worldised (Popper, 1972), rather than experiencing understanding as a dynamic evolutionary process.

The 'three only's' provide a framework for the teaching of any (mathematical) topic (Griffin & Gates, 1989; Mason & Johnston-Wilder, 2004), which acts as a reminder of the complex interplay in any topic between and among:

Behaviour: language patterns, conventions, techniques and practices, including inner incantations which guide the carrying out of procedures.

Emotions: source problems, domains of application, dispositions to enquire and explore, discipline-related aesthetic.

Awarenesses: core actions on which the topic is based, concept images (Tall & Vinner, 1981), accessible example spaces (Watson & Mason, 2005) and classic confusions and obstacles, whether epistemological (Bachelard, 1938/1980) or pedagogic in origin.

Here they are useful in describing teaching as a disciplined enquiry. It is not enough to have 'studied' the various aspects summarised by the framework, and indeed it is unlikely that any teacher education programme has sufficient time to expose novices to the full richness of even a majority of the topics they will be teaching. It is vital therefore that novices are introduced to disciplined ways of enquiring into the psycho-social roots of any particular topic, perhaps with the aid of such a psyche-based framework. It is also vital that teachers find awarenesses 'coming to mind' when preparing for and when teaching. These awarenesses include subject-pervasive themes and heuristics, particularities of the topic, and both specific pedagogic strategies and particular didactic (topic-related) tactics on which they can draw in their interactions with learners. There is a great deal more to teaching than 'knowing the subject' and 'knowing the answers to exercises', which is only encountered through ongoing enquiry into the origins and ramifications of subject-specific topics.

Preparing to teach a topic

Preparing oneself to teach a topic, from a 'psychologising the subject matter' perspective, taking into account the psyche-related structure of the topic as well as the propensities and dispositions of the learners, involves ongoing enquiry. It is possible to distinguish four phases of preparing to teach a topic: planning, enacting, sense-making and reflecting. In order to make them more memorable, it is convenient to make use of the now-rare stem 'paration' (*paratio*: to obtain for one's use; *paration*: making ready) in describing the phases as 'pre-paration', 'paration', 'meta-paration' and 'post-paration' which itself initiates further preparation.

Within each, I draw upon the framework derived from the chariot image and the 'three only's' for describing the structure of a topic.

Pre-paration

Planning part of a session, a session, a sequence of sessions, an entire course, degree, etc. Planning at the level of a specific topic includes:

- Accessing core awarenesses, key examples, major epistemological obstacles and obstacles arising from pedagogic choices in the past, language patterns and other practices particular to the topic, as well as source problems and a selection of domains of use of the topic to be taught.
- Selecting a few tasks from a domain of possible tasks, augmenting and modifying them in order to match current conditions as perceived by the teacher.
- Choosing how to present or initiate tasks so as to generate useful activity.
- Imagining learner responses and preparing responses to these, including optional tasks to draw upon if need be.
- Imagining choices that could be made, including reflective sense-making and evaluative tools.

Paration

Enacting an activity, session or sequence of sessions:

- Presenting tasks, initiating activity.
- Monitoring activity.
- Interacting with learners, sustaining activity, promoting both social interaction and individual action.

Meta-paration

Sense-making:

- Initiating meta-cognitive reflection, drawing learners out of immersion in their activity.
- Providing evaluation tools for learners.

Post-paration

Reflecting on recent events while preparing for future events.

- Note that these acts of teaching are relevant whether the teaching takes the form of a formal lecture (even an asynchronous or distance-teaching lecture), an interactive workshop or the construction and use of materials for individual learning. Some features, such as making spontaneous changes in the moment may not be possible because of the formality of the situation or because of working at a distance. Interactions may be synchronous (live or virtual), asynchronous or even unidirectional. No matter how they are manifested, the same thinking and the same acts need to be considered. Thus a teacher teaching at a distance needs to imagine the dominant kinds of responses to a task, so as to provide a commentary which speaks to most readers' experience most of the time.

- Each of these acts can be carried out in an *ad hoc* or superficial manner, and they can be carried out intuitively. However, to carry on repeatedly, professionally and effectively involves conforming to at least some of the established practices of the community and to becoming more methodical, if not systematic, as those practices mature and evolve. It is possible (and can be very effective) to teach the way a potter 'pots', depending on instinct and experience, on a deep sensitivity, for suitable actions to come to mind. However, because of the rapid accretion of habits, not all of which are always beneficial, it is vital that teachers be stimulated to bring some of those habits to the surface in order to examine, and possibly to modify them. This can be done by groups of teachers working together to trade descriptions of incidents so as to identify phenomena, and associated with those phenomena, different ways of responding pedagogically.

Acts of teaching

Teaching consists of a sequence of acts which precipitate or sustain actions involving learners. Actions require three impulses: something that initiates and directs; something which is acted upon; and something which mediates between these, enabling the action to take place (Bennett, 1956–66). The metaphor being used here is not so much that of a negotiator mediating between protagonists, but of a catalyst, an impulse or agent which liberates or enhances the possibility of interaction.

The triadic structure of action is widely recognised in the notion of semiotic mediation which is currently very popular in educational discourse. Cultural tools and artefacts used by teachers in order to support and promote specific practices by learners, and which are supposed to lead to 'understanding', are seen as mediators. Somehow the language of mediated action is supposed to inform the educational enterprise. However, one of the great educational chasms lies between instrumental and relational understanding (Skemp, 1976), between procedural and conceptual understanding (Kilpatrick, Swafford, & Findell, 2001), between training behaviour and educating awareness. Any action can be engaged in peripherally or superficially, without resulting in a lasting transformation of perception, conception or attention. Something more is required. The triadic structure of action offers six different modes of interaction between the three impulses (Bennett, 1956–66; Mason, 1979), going well beyond the limitations of tools simply as mediators. In brief, the six modes can be captured by the six 'Ex's':

Expounding: the teacher is enabled to make fresh contact with the content by virtue of (mediated by, made possible by) the presence (or future presence) of the students as audience.

Explaining: the teacher enters the world of the particular student and their difficulties through the presence of (mediated by) the specific content; only then can the matter be 'made plain', which usually involves a shift into exposition.

Exploring: the student engages with important ideas, technical terms, methods, etc. through the guidance of (mediation by) the teacher.

Examining: the student approaches the teacher to test whether personal criteria match those of the expert, through being examined on (mediated by) the content. Unfortunately very little assessment measures up to this ideal.

Exercising: desire to master the content (impulse coming via the content) is manifested through the student (mediator) to become more expert (as displayed by the teacher).

Expressing: the student is moved by the content (the flow of energies arising from insight and understanding, or by a particular difficulty) to express themselves in the presence of the teacher (as mediator); learning through articulating to others.

In education, the result of an action is activity. Effective activity requires a balance between two axes: one to do with current and desired states; and one to do with tasks and resources (Bennett, 1956–66). Thus if the intended goal is too distant from the current state, or if adequate resources are not available, or if tasks engaged in are insufficiently or excessively challenging, then the activity is likely to dissipate rather than result in self-sustaining activity. But the overall enterprise is to provoke learners into using familiar actions in new ways to meet fresh challenges, so as to encounter pervasive subject-specific themes, heuristics and disciplined practices. Put another way, the purpose of activity is to generate experience which can serve as the object of reflection (whether conscious or unconscious) and subsequent integration into functioning.

Reacting and responding: the making of choices

Monitoring student reaction is important, of course, but it is not enough to leave it at a superficial level. Reacting to learner reactions is potentially an unstable situation. If enquiry is limited to ‘how is it going?’ and ‘are they understanding, enjoying, engaged, ...?’, then teaching has not yet become disciplined enquiry.

Effective teaching is more disciplined than simply reacting to what is noticed. It involves working on what is actually noticed, on gaining access to alternative ways of acting in different situations, and preparing oneself to notice opportunities to make use of them. Just like short-lived new-year resolutions, intentions to act differently are intense at the moment of decision, but require sustained effort and the expenditure of energy in order to increase the likelihood of a good idea coming to mind when it is appropriate (Mason, 2002).

It is useful to distinguish between reacting and responding, based on observations of the subtleties of choice-making. Choices often appear to be made on the fly (McNair, 1978), and when someone observes another person’s session, there are always multiple moments at which alternative choices come to the mind of the observer. But as an experiential phenomenon in the moment, choice is often more like a sudden change of direction. Something comes to mind and is enacted almost before you are aware of it. Indeed, Nørretranders (1998) makes a compelling case that conscious awareness is the last to find out about choices! The body prepares and acts, the emotions follow, and only later does consciousness construct a self-justifying narrative which includes ‘I made a choice’. This is the origin of the user illusion of Nørretranders’ title. Careful enquiry into moments of apparent choice reveals that the roots have been laid down long before, and that what is being exercised is a choice or habit established long since. Put another way, it is rare to participate fully in a moment of choice, even when we think we are poised between alternatives. Indeed, the discipline of noticing (Mason, 2002) is an articulation of techniques accumulated over centuries by Eastern and Western ‘teachers’ who have taken the notion of ‘teaching as disciplined enquiry’ seriously, not only for themselves but for their students.

Integrating the psychological, the social and the subject discipline

From my perspective, effective teaching results from a weaving together of the psychological, the social and the specifics of the subject discipline which I think of as structural. Indeed I have already made a case for how the psychological and the subject discipline can be integrated through the 'structure of a topic' framework. It is not enough to be thoroughly versed in your subject: some motivated and lively people may learn, but many others may be turned off. It is not enough to care deeply for learners and their experience of studying: this can too easily turn into empty attempts to 'value' the individual or the group at the expense of what they are supposed to be learning. It is not enough to be psychologically aware, nor even to have an intellectual grasp of the psychological structure of topics. In this final section, I draw attention to some aspects of the full-scale integration of all three dimensions.

Teaching as a caring profession

Teaching seen as 'passing on knowledge to future generations' overlooks the fact that each generation has dispositions and propensities, strengths and weaknesses arising from the cultures in which learners are and have been immersed. Attempts to analyse the behaviour of effective teachers can usefully be interpreted in terms of teachers as carers (Askew, 1999, 2001; Watson, 2007). Some care deeply for their subject matter, and, because of this, influence at least some of their learners, usually the intellectually quick or motivated ones; others care deeply for the learners as learners, and, because of this, influence at least some of their learners, often the disaffected and overlooked, those classified as under-achieving or low-attaining. Those who display both forms of caring are likely to have the maximum influence. Learning to care subject-specifically (e.g. mathematically) for someone,² to take subject-specific care of and for their thinking as well as caring for individuals and groups as learners, has much in common with other caring professions.

Teaching as enquiry

In most instances in which the gerund *teaching* is used appropriately and the teaching itself is considered to be effective, there is ongoing enquiry. Effective teachers monitor learner reactions, and when possible alter their behaviour accordingly. This is a form of enquiry. For example, they may give tests, and they may notice changes in posture, gestures, facial expressions. But they may also notice what learners are attending to, and how. For example, getting learners to read a task description out loud, or to express in their own words whatever subject-based object they are gazing at (a line in a poem, a detail of an historical tract, a mathematical expression, etc.) often reveals aspects of the structure of their attention. Prompting them to construct a similar example of their own reveals at least some of the aspects that they are aware can be varied (Watson & Mason, 2005).

For face-to-face teaching, monitoring takes place on a moment-by-moment basis, even when the teaching takes the form of a formal lecture. I recall instances in which it was as if a fog of non-understanding rolled over me from the tiers (homonymically, the tears) of students, and despite the fact that I chose to continue for the remaining few moments of the session, I participated in a choice, a conscious response, rather than succumbing helplessly to habitual reaction. I also recall instances where a possibility to act differently suddenly popped into my head and I

found myself saying and acting in fresh ways, with a corresponding freshness in student responses.

Interacting with learners is a form of enquiry, and, based on personal experience, I conjecture that teaching is most effective when teachers are themselves enquiring. There are two reasons. First, the enquiring teacher infuses the situation with an approach, with a character, atmosphere and ethos that provides a genuineness and grounding to the interaction, while at the same time displaying or modelling a way of being, a participation in enquiry. Second, the teacher's attention is directed away from seeking expected and correct answers. Brent Davis (1996) calls the second of these, *listening for*, in contradistinction to *listening to* what learners are saying (and doing).

Surely the best way to engage learners in enquiry and to enculturate them into disciplines such as physics, mathematics, history, chemistry, art, etc., is to immerse them in a culture of enquiry. A culture of learning is much more complex than, for example, a simplistic interpretation of 'discovery learning' as requiring that learners need to discover everything for themselves. Rather, as Vygotsky pointed out, education is about *scientific knowledge*, about encountering and learning about concepts which are unlikely to arise through ordinary interactions with the world. A teacher who is enquiring is much more likely to contribute to a learner's sense of a discipline as a mode of enquiry. Of course, if the teacher is trying to stay one step ahead of learners concerning subject matter, there may be some benefit for learners because the teacher is fresh and appreciates at least some of their difficulties. But it is highly unlikely that in such a situation a teacher can permeate the interactions with overarching themes, rich connections and subtle awarenesses. This is why it is vital for a teacher to be effective and fresh, to pursue the subject discipline for themselves. This does not require original research nor even, necessarily, exposure to more advanced ideas. What *is* required, are experiences for the teacher which parallel or are analogous in some way to experiences learners might be having. These include opportunities to make use of human powers of sense-making but in ways that are particular to the subject discipline, instances of general subject-specific or even topic-specific themes and shifts of attention which again are subject- or even topic-specific. There may be instances where teachers can catch themselves reverting to a less sophisticated epistemological stance than that expected of or anticipated for learners. There may be opportunities to refresh sensitivity to subtle movements of attention between recognising relationships in a particular situation and perceiving these as properties that might also be instantiated elsewhere. An example of epistemological shifts among Harvard undergraduates was described by Perry (1968; see also Copes, 1982).

Conclusion

I hold that someone who is not themselves learning in a situation cannot be teaching as effectively as possible. For teachers, this means increasing sensitivity to notice not only salient features of the subject discipline's process of enquiry and validation, but also salient features of the learning process and of the choices made when preparing for and interacting with learners. For teacher educators, this means increasing sensitivity to notice not only as a teacher, but at an even more complex level of teacher awareness (Mason, 1998).

The principal components identified here as the subject of enquiry when teaching is viewed as *disciplined enquiry* have been:

- subject-specific epistemology and ontology;
- pedagogical strategies and didactical tactics;
- psychosocial specifics of content, learners and teacher;
- the use and development of natural powers;
- role of fundamental themes, heuristics and practices (techniques, methods, etc.); and
- core awarenesses which each topic develops.

I view learning as developing sensitivity to notice in subject-domain-specific ways, and this applies both to the subject being taught and to the teaching of that subject. Ongoing enquiry is needed into topic-specific core awarenesses, and how through their own developing powers these serve as the basis for topic- and subject-specific practices and techniques. Ongoing enquiry is needed concerning the development of learner-oriented sensitivities so that learners are provoked into harnessing their emotional energy in developing dispositions to train their behaviour and to educate their awareness concerning the subject.

All is founded on enquiry into shifts in what is attended to and how it is attended to, so as to be alert to opportunities to immerse learners in activity in which they, too, will experience or encounter those shifts. Ongoing enquiry is needed into developing reflective practices which are sufficiently varied to scaffold (with appropriately judged fading) learners in internalising those reflective practices so as to learn how to learn, and how to engage in the subject discipline.

Notes

1. A modern version of the chariot image in terms of a hackney carriage can be found in Gurdjieff (1950, pp. 1192–1200), an ancient version in terms of a mansion being run by servants can be found in Plato's Republic (see Hamilton & Cairns, 1961, II 488ff.).
2. I am indebted to Libby Jared (personal communication, 2008) for this idea which emerged during her study concerning secondary school students engaging in forums with rubrics about how to care for, support and promote the mathematical thinking of others as they develop mathematically themselves (see also Oates, Paterson, Reilly, & Statham, 2005).

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